

CLAIMS

What is claimed is:

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1. A roller pinion gear for use in a power assist steering system, comprising a roller wheel having a plurality of radially projecting teeth about its periphery, wherein said teeth comprise pins rotatably mounted in and projecting from the periphery of said roller wheel.

2. The pinion gear of claim 1, further comprising a pinion shaft coupled to the roller wheel.

3. An assist pinion mechanism for a power assist steering system, comprising an assist pinion, and a roller pinion gear, wherein said assist pinion has a first end and a second end, wherein said first end may engage a rack, and said second end is coupled to said pinion gear, wherein said pinion gear comprises a roller wheel having a plurality of radially projecting teeth about its periphery, wherein said teeth comprise pins rotatably mounted in and projecting from the periphery of said roller wheel.

4. The pinion mechanism of claim 3, further comprising a roller screw, wherein said roller screw has a threaded portion having helical threads thereon, and said threaded portion is situated to engage at least one of said pins upon rotation of said roller screw.

5. The pinion mechanism of claim 4, further comprising an electric motor having a rotating output shaft, wherein said output shaft is coupled to said roller screw.

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6. The pinion mechanism of claim 5, wherein the gear ratio between said roller screw and said assist pinion is between about 15:1 and about 22:1.

5 7. The pinion mechanism of claim 5, wherein the gear ratio between said roller screw and said assist pinion is about 22:1.

8. The pinion mechanism of claim 5, wherein said mechanism has a power transfer efficiency greater than 70% at load torques above 200 in-lbf at 1000 rpm.

10 9. The pinion mechanism of claim 4, wherein said threaded portion of said roller screw has an arcuate contacting profile with regard to said roller wheel pins.

15 10. A power assist steering system, comprising a rack, an assist pinion, and a pinion gear, wherein said assist pinion has a first end and a second end, wherein said first end engages said rack, and said second end is coupled to said pinion gear, wherein said pinion gear comprises a roller wheel having a plurality of radially projecting teeth about its periphery, wherein said teeth comprise pins rotatably mounted in and projecting from the periphery of the roller wheel.

20 11. The steering system of claim 10, further comprising a roller screw, wherein said roller screw has a threaded portion having helical threads thereon, and said threaded portion is situated to engage at least one of said pins upon rotation of said roller screw.

12. The steering system of claim 11, further comprising an electric motor having a rotating output shaft, wherein said output shaft is coupled to said roller screw.

13. The steering system of claim 11, wherein said roller screw and said pinion gear have a gear ratio with respect to each other of about 15:1 to about 22:1.

14. The steering system of claim 12, wherein the gear ratio between said roller screw and said assist pinion is about 22:1.

15. The steering system of claim 12, wherein the efficiency of torque transfer from the output of said motor to said assist pinion is greater than 70% at load torques above 200 in-lbf at 1000 rpm.

16. A power assist steering system, comprising an electric motor having a rotating output shaft, a steering mechanism, and a roller gear coupling said electric motor output shaft to said steering mechanism.

17. The steering system of claim 16, wherein said steering system comprises an assist pinion, and the power transfer efficiency between said output shaft and said assist pinion is greater than 70% at load torques above 200 in-lbf at 1000 rpm.

18. A method for transferring power from a rotating input shaft to an assist pinion in a power assist steering system, comprising coupling an assist pinion that forms part of a steering system to a rotating input shaft via a roller pinion gear, wherein the pinion gear comprises a roller wheel having a plurality of radially projecting teeth about its periphery, wherein said teeth

comprise pins rotatably mounted in and projecting from the periphery of the roller wheel.

19. The method of claim 18, wherein said rotating input shaft turns a roller screw having helical threads thereon, wherein upon rotation of the roller screw at least one thread contacts at least one of said pins.

20. The method of claim 18, wherein the power transfer efficiency between said rotating input shaft and said assist pinion is greater than 70% at load torques above 200 in-lbf at 1000 rpm.

21. The method of claim 19, wherein the gear ratio between said rotating input shaft and said assist pinion is between about 15:1 to about 22:1.

22. The method of claim 19, wherein the gear ratio between said rotating input shaft and said assist pinion is about 22:1